

What is claimed is:

1. A gas sensor element comprising:
 1. a gas cavity into which gasses consisting essentially of
- 5 oxygen molecules and a specified oxygen containing gas are admitted through a given dispersion resistance;
 2. an oxygen pump cell including an oxygen ion-conducting member, a first pump cell electrode, and a second pump cell electrode which is exposed to the gas cavity, said oxygen pump cell
- 10 being responsive to application of a voltage across the first and second pump cell electrodes to selectively pump oxygen molecules into and out of said gas cavity for adjusting a concentration of the oxygen molecules within said gas cavity to a desired value;
 3. an oxygen monitor cell including an oxygen ion-conducting member, a first monitor cell electrode, and a second monitor cell electrode which is exposed to the gas cavity, said oxygen monitor cell working to produce an electric signal indicative of a concentration of the oxygen molecules within said gas cavity; and
- 15 a sensor cell including an oxygen ion-conducting member, a first sensor cell electrode, and a second sensor cell electrode which is exposed to said gas cavity, said sensor cell working to produce an electric signal indicative of a concentration of the specified oxygen containing gas within said gas cavity,
 - wherein said oxygen monitor cell and said sensor cell are
- 20 disposed at substantially the same location in a direction of flow of the gasses within the gas cavity.

2. A gas sensor element as set forth in claim 1, further comprising a reference gas cavity into which gasses containing a constant concentration of oxygen molecules are admitted, and

5 wherein the first monitor cell electrode is exposed to said reference gas cavity, and said oxygen monitor cell is responsive to application of a voltage across the first and second monitor cell electrodes to produce a current flowing between the first and second monitor cell electrodes as a function of the concentration of

10 oxygen molecules within the gas cavity.

3. A gas sensor element as set forth in claim 2, wherein the voltage applied across the first and second pump cell electrodes is controlled so as to bring the current produced by said oxygen

15 monitor cell into agreement with a constant value for adjusting the concentration of oxygen molecules within the gas cavity to the desired value.

4. A gas sensor element as set forth in claim 1, further

20 comprising a reference gas cavity into which gasses containing a constant concentration of oxygen molecules are admitted, and wherein the first monitor cell electrode is exposed to said reference gas cavity, and said oxygen monitor cell works to produce an electromotive force between the first and second monitor cells as a

25 function of the concentration of oxygen molecules within the gas cavity.

5. A gas sensor element as set forth in claim 4, wherein the voltage applied across the first and second pump cell electrodes is controlled so as to bring the electromotive force produced by said 5 oxygen monitor cell into agreement with a constant value for adjusting the concentration of oxygen molecules within the gas cavity to the desired value.

6. A gas sensor element as set forth in claim 1, wherein said 10 sensor cell is responsive to application of a voltage across the first and second sensor cell electrodes to produce a current flowing between the first and second sensor cell electrodes as a function of the concentration of the specified oxygen containing gas within the gas cavity.

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7. A gas sensor element as set forth in claim 1, wherein said oxygen monitor cell is responsive to application of a voltage across the first and second monitor cell electrodes to produce a current flowing between the first and second monitor cell electrodes, and 20 said sensor cell is responsive to application of a voltage across the first and second sensor cell electrodes to produce a current flowing between the first and second sensor cell electrodes, and wherein a difference between the current produced by said oxygen monitor cell and the current produced by said sensor cell is provided as a 25 sensor output indicating the concentration of the specified oxygen containing gas.

8. A gas sensor element as set forth in claim 1, wherein said gas cavity consists essentially of a first chamber and a second chamber which communicate with each other through a given 5 diffusion resistance, and wherein said oxygen pump cell is disposed within the first chamber, and said oxygen monitor cell and said sensor cell are disposed within the second chamber.

9. A gas sensor element as set forth in claim 1, further 10 comprising a partition disposed between said oxygen monitor cell and said sensor cell within said gas cavity.

10. A gas sensor element as set forth in claim 1, wherein each of the second pump cell electrode and the second monitor cell 15 electrode exposed to said gas cavity is made of a cermet containing main metallic components of Pt and Au, and the second sensor cell electrode exposed to said gas cavity is made of a cermet whose main component is a metal alloy containing Pt and at least one of Rh and Pd.

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11. A gas sensor element as set forth in claim 1, wherein the second oxygen monitor cell electrode and the second sensor cell electrode have ends oriented to an upstream side of the flow of the gasses within said gas cavity, one of the ends being shifted from 25 the other in the direction of the flow of the gasses by 2mm or less.

12. A gas sensor element as set forth in claim 1, wherein an interval between a line about which the second monitor cell electrode of said oxygen monitor cell and the second sensor cell electrode of said sensor cell are arranged to be axi-symmetric and a center line of a gas path formed upstream of the second monitor cell and the second sensor cell within said gas cavity is 1mm or less.

13. A gas sensor element as set forth in claim 1, further comprising an air-fuel ratio sensor working to measure a concentration of an air-fuel ratio of the gasses, said air-fuel ratio sensor including an oxygen ion-conducting member, a first electrode, and a second electrode attached to surfaces of the oxygen ion-conducting member, the first electrode being exposed to a gas space within which the gasses exist, the second electrode being exposed to a reference gas cavity into which gasses containing a constant concentration of oxygen molecules are admitted.

14. A gas sensor element as set forth in claim 1, wherein said gas cavity has a width and a length extending in the direction of flow of the gasses, and wherein the second monitor cell electrode and the second sensor cell electrode are arranged in parallel to each other in a widthwise direction of the gas cavity.

15. A gas sensor element as set forth in claim 1, wherein the

gas sensor element has a length extending in the direction of flow of the gasses, and wherein the second monitor cell electrode and the second sensor cell electrode are laid to overlap each other in a thicknesswise direction perpendicular to the length of the gas

5 sensor element.